Federal Networking and Information Technology R&D

Remarks to the HCSS CG-Sponsored National Workshop on Aviation Software Systems: Design for Certifiably Dependable Systems

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Hilton Old Town Alexandria
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Director

National Coordination Office (NCO) for Networking and Information Technology Research and Development

Overview of the NITRD Program

- **Statutory basis for the NITRD Program**
  - High-Performance Computing Act of 1991
  - Next Generation Internet Research Act of 1998
- **NITRD Subcommittee, National Science and Technology Council**
  - Representatives from 14 program agencies + OMB + OSTP + NCO/NITRD
  - Has two Interagency Working Groups (IWGs) and five Coordinating Groups (CGs)
- **Budget of $3.1 billion proposed for FY 2007**
- **One of the few formal interagency R&D efforts – regarded as a successful model of Federal interagency coordination**

NITRD Member Agencies

- Agency for Healthcare Research and Quality (AHRQ)
- Defense Advanced Research Projects Agency (DARPA)
- Department of Energy/National Nuclear Security Administration (DOE/NNSA)
- Department of Energy/Office of Science (DOE/SC)
- Department of Homeland Security (DHS)
- Environmental Protection Agency (EPA)
- National Aeronautics and Space Administration (NASA)
- National Archives and Records Administration (NARA)
- National Institutes of Health (NIH)
- National Institute of Standards and Technology (NIST)
- National Oceanic and Atmospheric Administration (NOAA)
- National Security Agency (NSA)
- National Science Foundation (NSF)
- Office of the Secretary of Defense (OSD) and DoD Service Research Organizations

NITRD Participating Agencies

- Central Intelligence Agency (CIA)
- Department of Justice (DOJ)
- Department of State (DOS)
- Department of Transportation (DOT)
- Department of the Treasury (Treas)
- Federal Aviation Administration (FAA)
- Food and Drug Administration (FDA)
- General Services Administration (GSA)
- Technical Support Working Group (TSWG)
- United States Geological Survey (USGS)

Scope of NITRD Program

- **Eight major R&D areas, called Program Component Areas (PCAs):**
  - **High End Computing Infrastructure and Applications (HEC I&A)**
  - **High End Computing Research and Development (HEC R&D)**
  - **Cyber Security and Information Assurance (CSIA)**
  - **Human-Computer Interaction and Information Management (HCI&IM)**
  - **Large Scale Networking (LSN)**
  - **High Confidence Software and Systems (HCSS)**
  - **Social, Economic and Workforce Implications of IT (SEW)**
  - **Software Design and Productivity (SDP)**
- **Broad participation: R&D conducted by thousands of researchers spanning government laboratories, national laboratories, universities, and private-sector partnerships**
- **Technical Leadership: NITRD efforts shape national R&D agendas**

NITRD Coordination

HEC I&A

HEC R&D

CSIA

HCI&IM

LSN

HCSS

SEW

SDP

- **The NITRD Subcommittee coordinates broad goals, policies, and directions for the Program**
  - Subcommittee members are senior NITRD agency managers
  - Serves as liaison with White House officials
  - Oversees preparation of annual NITRD Supplement to the President's Budget

NITRD Coordination

HEC I&A

HEC R&D

CSIA

HCI&IM

LSN

HCSS

SEW

SDP

- **In each PCA, agency managers participate in an Interagency Working Group (IWG) or a Coordinating Group (CG)**
  - IWGs and CGs, co-chaired by agency reps, meet monthly to:
    - Develop joint or multi-agency R&D efforts
    - Exchange information
    - Coordinate R&D plans across agencies to avoid duplication, leverage investments, maximize potential for widely useful results
    - Cooperate on multi-agency workshops, program and grant reviews, development of technical publications
  - Many Federal agencies, not just those in the NITRD Program, participate in IWG and CG activities
  - IWG, CG co-chairs meet as a group to discuss cross-cutting issues

NITRD Program Coordination Structure

White House
Executive Office of the President

Office of Science and Technology Policy

President's Council of Advisors on Science and Technology (PCAST) serving as the **President's Information Technology Advisory Committee (PITAC)**

National Science and Technology Council

Committee on Technology

Committee on Homeland and National Security

National Coordination Office (NCO) for Networking and Information Technology Research and Development

Subcommittee on Networking and Information Technology Research and Development (NITRD)

Subcommittee on Infrastructure

High End Computing (HEC) Interagency Working Group (HEC I&A and HEC R&D)

Cyber Security and Information Assurance (CSIA) Interagency Working Group

Human Computer Interaction and Information Management (HCI&IM) Coordinating Group

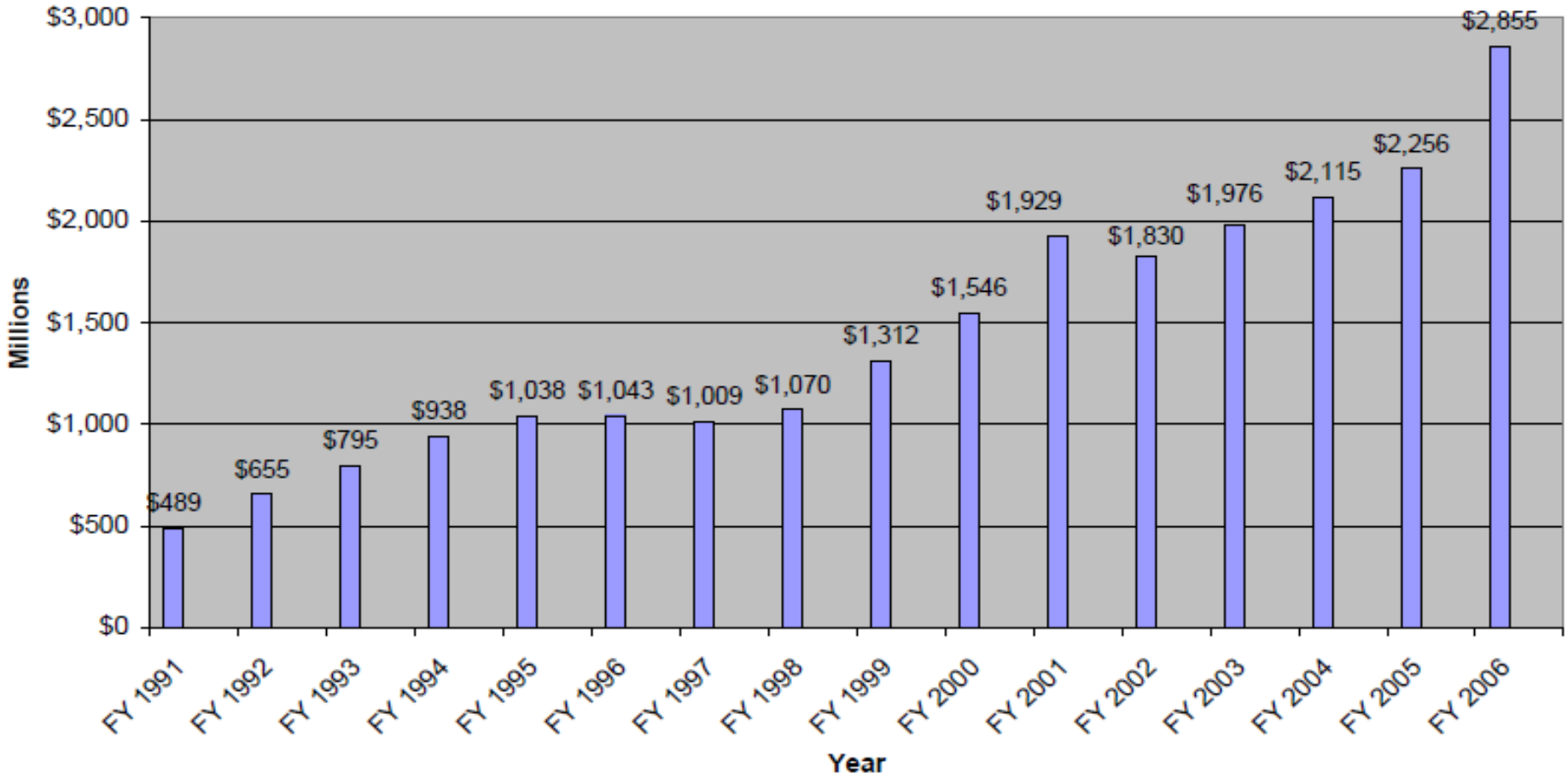
Large Scale Networking (LSN) Coordinating Group

High Confidence Software and Systems (HCSS) Coordinating Group

Social, Economic, and Workforce Implications of IT and IT Workforce Development (SEW) Coordinating Group

Software Design and Productivity (SDP) Coordinating Group

NITRD Program Budget History



Source: Annual Supplements to the President's Budget

Budget Highlights

- **NSF is largest single agency**
  - Accounts for almost 30% of the NITRD budget
- **Multiple DoD components collectively have larger budget**
  - OSD, DoD Services, DARPA, NSA, account for 35% of the NITRD budget
- **FY 2007 budget request is $219 million higher than FY 2006 estimated spending**
  - HEC PCAs account for over half the increase, HCI&IM for a quarter
  - Note: amount agencies actually spend is generally higher than President's request

President's American Competitiveness Initiative (ACI)

- **Calls for a doubling over 10 years of the investment in three Federal agencies — NSF, DOE/SC, and NIST — that support basic research programs in the physical sciences and engineering**
- **All three are NITRD Program member agencies; received 2007 budget increases that exceed the percentage increase in the overall NITRD budget**
  - NSF: 12% increase
  - DOE/SC: 35% increase
  - NIST: 10% increase
  - Collective increase for ACI agencies is $186 million (17% above 2006 estimates)
  - Increase in ACI agency budgets accounts for over 85% of the overall NITRD Program budget increase for 2007
- **These agencies' physical sciences and engineering R&D will play a key role in generating technical advances in IT systems**

NCO/NITRD Objectives

- **The National Coordination Office (NCO) for NITRD supports the Program's multi-agency technical activities.**
- **The NCO's objectives are:**
  - To support NITRD-related policy making in the White House Office of Science and Technology Policy (OSTP)
  - To serve as the Federal focal point for interagency technical planning, budget planning, and coordination for the Federal NITRD Program
  - To serve as a source of timely, high-quality, technically accurate, in-depth information on accomplishments, new directions, and critical challenges relevant to the NITRD Program

Collaborative Vision for the NITRD Program

- Increased NITRD interagency R&D coordination and planning activities
- Increased conferences, workshops, and meetings that aid in identifying NITRD needs in strategic areas that are aligned with and benefit Federal missions and national priorities
- Increased NITRD agency interaction and outreach with non-governmental experts to help identify and implement NITRD Program priorities

IT in the Nation's Critical Infrastructures

- **IT infrastructure (components and systems) today provides core functionalities for the Nation's most important infrastructures:**
  - National defense and national security networks
  - Power grids
  - Water and food supply systems
  - Financial systems
  - Industrial control systems
  - Air traffic control networks and aviation systems
  - Emergency communications systems
- **The IT infrastructure itself is a critical element of many critical infrastructures**

NITRD and Safety-Critical Systems that Support Critical Infrastructures

- **Computer-based safety-critical systems and devices are now pervasive in:**
  - Military and civilian aerospace applications
  - Ground transport vehicles
  - Medical care
  - Hazard detection
  - Physical security
  - Manufacturing and industrial applications
- **Safety-critical and other high-confidence embedded software and systems are of strategic importance to Federal missions, the Nation's industries, and to the U.S. economy**

NITRD and Safety-Critical Systems that Support Critical Infrastructures

- **The technical challenges of designing and building very high assurances into increasingly complex IT components and systems are significant**
- **Today, high assurance is difficult to achieve, and arguably impossible to achieve**
- **HCSS agencies are focusing significant attention on identifying IT R&D needs and appropriate investments for building the next generation of high-confidence technologies**
  - Emphasis on integrating necessary assurances (e.g., safety, dependability, reliability, and robustness) from the ground up

NITRD HCSS Approach

- **Foundational R&D applicable across multiple critical domains. Initial domains targeted:**
  - Aviation systems
  - Medical devices
  - Industrial process control (SCADA) systems
- **An interdisciplinary viewpoint aimed at addressing the complexities of achieving high confidence**
  - Computer science
  - Engineering
  - Bio, environmental, and physical sciences

NITRD HCSS Approach

- **Complements the work of other NITRD areas by focusing on the scientific foundations needed for building dependable systems. Related activities include:**
  - HEC: Advanced platforms and software for modeling/simulation of complex systems (e.g., aircraft, air traffic control systems)
  - CSIA: working toward a roadmap of R&D needs in cyber security and information assurance
  - HCI&IM: R&D in integration of large-scale science and engineering data; multimodal interfaces; cognitive systems
  - LSN: R&D in next-generation optical architectures to improve network reliability, security, and performance
  - SEW: Education and training of the next generation of IT researchers
  - SDP: Foundational R&D in the science of software design for improved cost-effectiveness and “producibility”

HCSS-Aviation Safety Workshop's Importance to the NITRD Program

- **The HCSS-Aviation Safety workshop is an excellent example of NITRD coordination at work**
  - The HCSS CG is working to identify the complex NITRD challenges that underlie the safety of our Nation's critical aviation infrastructure
- **Your presence here today shows your interest in contributing to a collaborative effort of the Federal, academic, and industry research communities to identify the IT technical challenges and develop an R&D agenda for achieving high-confidence aviation systems**

Creating the NGATS Also Requires Closely Coordinated R&D Partnerships

"Research will continue to help us find the right balance between a centralized ground system and a totally distributed system, where aircraft 'self-manage' their flight with full knowledge of their environment. That research is being undertaken through a close partnership with the research community, industry, and other stakeholders. This process ensures full coordination of research across agency lines and between government and the private sector in ways that have not been done in the past."

– *Statement by Jeffrey N. Shane, Under Secretary of Transportation for Policy, before the House Committee on Science, Subcommittee on Space and Aeronautics, on the status of the Next Generation Air Transportation System (NGATS) of 2025, March 29, 2006*

Comments or Questions?

- More detailed information on the NITRD Program is available in *The FY 2007 Supplement to the President's Budget for the NITRD Program*

- To download a copy of the Budget Supplement or any of our other publications, please visit: http://www.nitrd.gov/